Notice No. 3

Rules and Regulations for the Classification of Naval Ships, January 2015

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

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Amendments to	Effective Date
Volume 1, Part 1, Chapter 2, Introduction, Sections 1, 2, 3, 4 & 6	1 January 2016
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Volume 1, Part 4, Chapter 2, Sections 5 & 10	1 January 2016
Volume 1, Part 4, Chapter 3, Section 2	1 January 2016
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Volume 1, Part 6, Chapter 1, Section 2	1 January 2016
Volume 1, Part 6, Chapter 3, Sections 7 & 9	1 January 2016
Volume 1, Part 6, Chapter 6, Section 1	1 January 2016

Lloyd's Register

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Volume 1, Part 1, Chapter 2

Classification Regulations

Effective date 1 January 2016

■ *Introduction*

Definition of Naval Class

Naval ship Classification may be regarded as the development and worldwide implementation of published Rules and Regulations, which, in conjunction with proper care and conduct on the part of the Owner, will provide for:

(a) the structural strength and the watertight integrity of all essential parts of the hull and its appendages; this includes compliance with a suitable damage stability standard accepted by Lloyd's Register (hereinafter referred to as 'LR');

(b) the safety and reliability of engineering systems essential for propulsion, steering and other ~~essential auxiliary engineering systems~~ Mobility and/or Ship Type-specific functions, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation;

(c) the operation and functioning of associated systems installed for operational requirements relating to the ship type, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation; and

(d) the effectiveness of other defined features and systems which have been built into the ship in order to establish and maintain basic conditions on board whereby appropriate stores, fuels, equipment and personnel can be safely carried whilst the ship is at sea, at anchor, or moored in harbour.

■ *Section 1*

Conditions for Classification

1.1 Framework of Classification

1.1.12 It is a requirement that, where the vessel has fitted on board lifting appliances which are considered by LR to be ~~essential~~ necessary for it to fulfil its ~~primary operational~~ Ship Type role (e.g. aircraft lifts on aircraft carriers, landing platform dock stern ramp) and that there are no alternative means of operation, ~~that it is classed in accordance with the requirements of the LA notation. The~~ the lifting appliance(s) are to be designed, built and surveyed in accordance with LR's *Code for Lifting Appliances in a Marine Environment* (LAME) and the notation **LA** is to be assigned. This notation will be assigned in association with a Register of Lifting Appliances listing the appliances covered. The Register of Lifting Appliances is the responsibility of the Owner. Elsewhere, classification of lifting appliances is optional and may be assigned at the request of the Owner on compliance with the appropriate requirements, *see* 3.9.1.

■ *Section 2*

Scope of the Rules

2.1 Applicable ship types

(*Part only shown*)

2.1.1 The Rules are applicable to naval ships designed and constructed for the purpose of carrying and operating naval systems. For the purposes of Classification, naval ships can be grouped into ~~four~~ five categories as follows:

(d) ~~**NSA**~~ **NS(SR) ships**

This category covers auxiliary naval ships used for the support of civil and naval operations. They may have a variety of roles including the movement of military and other personnel, ammunition, vehicles, stores and fuels and the transfer of such to other naval ships. They do not have a defined ~~offensive~~ military role but may have a limited self-defence capability. In general, the ships will comply with LR's Rules for Ships and any relevant requirements in Vol 1, Pt 1, Ch 3, 17 Classification of ships built under survey to LR Classification Rules and Regulations other than LR Naval Ship Rules and Regulations and satisfy as far as practicable the requirements of the International Conventions applicable to the ship type. Any deviation from the applicable International Convention requires agreement with the National Administration. A Design and Operating Scenario Statement declared by the Owner stating the role of the ship in terms of the carriage of equipment, personnel, stores and fuels is to be acceptable to LR. ~~The assignment of the **NSA** ship type notation is dependent on the ship being in Machinery Naval Class with the ✠**LMC**, ✠̄**LMC**, [✠]**LMC**, **LMC** or **MCH** notations.~~

(e) **NS(SSC) ships**

This category covers ships that have been designed and built using the LR *Rules and Regulations for the Classification of Special Service Craft* (hereinafter referred to as the Rules for Special Service Craft). This category is limited to ships typically below 1500 tonnes displacement or 110m length. They do not have a defined military role but may have a limited self-defence capability and are usually designed and constructed for constabulary purposes such as coastal defence or patrol duties. In general, ships are required to comply with International Conventions applicable to the ship type. Deviations from applicable International Conventions require agreement with the Navy or Naval Administration and where applicable the National Administration. Where an **NS(SSC)** notation is applicable, the requirements of the Rules for Special Service Craft, Pt 1, Ch 2 Classification Regulations are not applicable and the requirements of this Chapter are to be applied.

■ *Section 3*

Character of Classification and Class notations

3.3 Character symbols

(*Part only shown*)

3.3.5 Alternative or additional standards relating to the application of a character symbol or Class notation may be specified. Where these alternative or additional standards have been agreed by LR and the Naval Administration, a formal process for approval, construction, testing and verification throughout life has been established, this feature will be recognised by the addition of **(NS)** to a character symbol or Class notation~~-~~. *See also* Vol 1, Pt 1, Ch 2, 3.4 Class notations. The alternative or additional requirements are to be clearly defined and referenced in the Classification Certificates and any required registers such as the register of lifting appliances. The following are examples of character symbols and Class notations that may recognise alternative or additional standards:

✠ LMC(NS) Propelling and ~~essential auxiliary~~ other machinery for Mobility and/or Ship Type systems (see Vol 2, Pt 1, Ch 1, 3 Engineering system designation), constructed, installed and tested under Special Survey in accordance with LR's Rules and Regulations for assignment of **✠ LMC** Class notation and additional specified requirements, *see* Vol 1, Pt 1, Ch 2, 3.2 Tailoring – Departures from the Rules and Rule additions and Vol 1, Pt 1, Ch 2, 3.3 Character symbols.

3.5 Ship type notations

3.5.2 A list of ship type notations for which a ship may be eligible is:

NS1 This notation will be assigned to NS1 category naval ships, as defined in Vol 1, Pt 1, Ch 2, 2.1 Applicable ship types

NS2 This notation will be assigned to NS2 category naval ships, as defined in Vol 1, Pt 1, Ch 2, 2.1 Applicable ship types

NS3 This notation will be assigned to NS3 category naval ships, as defined in Vol 1, Pt 1, Ch 2, 2.1 Applicable ship types

~~NSA~~ NS(SR) This notation will be assigned to ~~NSA~~ NS(SR) category naval ships, as defined in Vol 1, Pt 1, Ch 2, 2.1 Applicable ship types

NS(SSC) This notation will be assigned to NS(SSC) category naval ships, as defined in Vol 1, Pt 1, Ch 2, 2.1.1(e).

(*Part only shown*)

3.5.4 The **~~NSA~~ NS(SR)** ship type notation will be followed by a description which indicates the operational role for which the ship is designed and operated. The following are examples of the description of an ~~NSA~~ NS(SR) ship's role:

Landing Craft.
~~Air Cushioned Support Vehicle.~~

3.5.5 The **NS(SSC)** ship type notation will be followed by a description that indicates the operational role for which the ship is designed and operated. The following are examples of the descriptions of an **NS(SSC)** ship's role:

(Offshore or Inshore) Patrol Boat
(Offshore or Inshore) Patrol Vessel
Landing Craft
Air Cushioned Vehicle.

3.5.6 **NS(SR) and NS(SSC) Vessels**

For vessels that are using either the **NS(SR)** or **NS(SSC)** ship type notations, the following requirements are to be complied with:

(a) When naval ship classification using either the **NS(SR)** or **NS(SSC)** notation is requested, application should be made in writing.

(b) Where vessels are to be built to these notations, the requirements set out in (c) to (e) are to be complied with.

(c) Plans showing the features of the ship not covered, or fully covered by the Rules for Special Service Craft or Rules for Ships, as appropriate, are to be submitted. Where an appraisal is undertaken, strength and, where appropriate, stiffness aspects are to be addressed. Examples of features of the ship not covered, or fully covered by the Rules for Special Service Craft or Rules for Ships include:

   (i) Masts (*see* Vol 1, Pt 6, Ch 3, 16 Masts).
   (ii) Weapon system seats (*see* Vol 1, Pt 4, Ch 2, 9 Military installation and operational loads).
   (iii) RAS seats and landing areas (*see* Vol 1, Pt 4, Ch 1, 5 Military design requirements and Ch 2, 9 Military installation and operational loads).
   (iv) Aircraft landing guides (*see* Vol 1, Pt 4, Ch 2, 10 Aircraft operations).
   (v) Towing points (*see* Vol 1, Pt 3, Ch 5, 7 Towing arrangements).
   (vi) Military loads (*see* Vol 1, Pt 4, Ch 2 Military Load Specification).
   (vii) Beaching (*see* Vol 1, Pt 4, Ch 2, 8 Strengthening requirements for beach landing operations).
   (viii) Material grades (*see* Vol 1, Pt 6, Ch 6 Material and Welding Requirements).
   (ix) Watertight integrity (*see* Vol 1, Pt 3, Ch 4 Closing Arrangements and Outfit).
   (x) Strength of watertight structure (*see* Vol 1, Pt 6, Ch 3 Scantling Determination).
   (xi) Lifts, ramps and shell doors (*see* Vol 1, Pt 4, Ch 3 Special Features).

(d) Plans of systems within the scope of classification, as categorised in accordance with Vol 2, Pt 1, Ch 1, 3.1 Categories and not covered by the Rules for Special Service Craft or Rules for Ships, as appropriate, are to be submitted to LR for approval in accordance with the requirements of the respective requirements of these Rules. The following are examples of such systems:
   (i) Aircraft/helicopter and vehicle fuel storage and distribution systems (*see* Vol 2, Pt 7, Ch 4 Aircraft/Helicopter/Vehicle Fuel Piping and Arrangements).
   (ii) Chilled water systems (*see* Vol 2, Pt 7, Ch 5 Ship Type Piping Systems).
   (iii) High pressure sea-water systems (*see* Vol 2, Pt 7, Ch 5 Ship Type Piping Systems).
   (iv) High and low pressure compressed air systems (*see* Vol 2, Pt 7, Ch 5 Ship Type Piping Systems).
   (v) Hydraulic power actuating systems (*see* Vol 2, Pt 7, Ch 5 Ship Type Piping Systems).
   (vi) Made and fresh water systems (*see* Vol 2, Pt 11, Ch 1 Made and Fresh Water Systems).
   (vii) Heating, ventilation and cooling arrangements (*see* Vol 2, Pt 11, Ch 2 Heating, Ventilation and Cooling Arrangements).
   (viii) Replenishment at sea arrangements where a **RAS** notation is requested (*see* Vol 3, Pt 1, Ch 5 Replenishment at Sea (RAS) Systems).

(e) Confirmation regarding the items below is to be supplied.
   (i) Fire Safety arrangements are to be in accordance with a specified fire safety standard and certified accordingly. For vessels being built to the **NS(SSC)** notation, the requirements of the Rules for Special Service Craft, Pt 17, Fire Protection, Detection and Extinction, are appropriate.
   (ii) Stability is to be in accordance with a recognised stability standard which addresses both intact and damage stability criteria. Details of stability approval, including estimated position of waterline after damage, are to be provided to LR prior to any approvals of structural arrangements.
   (iii) Munitions safety is to be in accordance with the navies' own technical requirements for the safe stowage and handling of the types and quantities of munitions carried.

(f) Details of any aspects which may affect multiple systems are to be provided to LR including, but not limited to:
   (i) Shock.
   (ii) Operation at angles of trim or list greater than those assumed in the Rules for Special Service Craft.
   (iii) Elevated or reduced ambient conditions either due to operational areas or close down arrangements.
   (iv) Operational requirements for electromagnetic compatibility.
   (v) Quality of electrical power supplies.

(*Part only shown*)

~~3.5.5~~ 3.5.8 **Design and Operating Scenario Statement:**

This is required for **~~NSA~~ NS(SR) or NS(SSC)** ships and is to detail the civil and naval support functions of the ship. The statement is to include but is not limited to the following:

Existing paragraph 3.5.6 *has been renumbered* 3.5.9.

(*Part only shown*)

Table 2.3.2: Machinery Class Notations

Machinery Notations *See* Vol 1, Pt 1, Ch 2, 3.9 Machinery and Engineering Systems notations
✠ **LMC** ~~Propulsion and essential machinery~~ Mobility and/or Ship Type systems
✠ **LMC** ~~Propulsion and essential machinery~~ Mobility and/or Ship Type systems
[✠] **LMC** ~~Propulsion and essential machinery~~ Mobility and/or Ship Type systems
LMC ~~Propulsion and essential machinery~~ Mobility and/or Ship Type systems
MCH ~~Propulsion and essential machinery~~ Mobility and/or Ship Type systems

3.9 Machinery and Engineering Systems notations

(*Part only shown*)

3.9.1 The following class notations are associated with the machinery construction and arrangement, and may be assigned:

✠ **LMC** This notation will be assigned when the propelling and ~~essential auxiliary~~ other machinery for Mobility and/ or Ship Type systems, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation, has been constructed, installed and tested under Special Survey and in accordance with LR's Rules and Regulations.

✠̄ **LMC** This notation will be assigned when the propelling and ~~essential auxiliary~~ other machinery for Mobility and/or Ship Type, systems, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation, has been constructed under the survey of a recognised authority in accordance with the Rules and Regulations equivalent to those of LR. In addition the whole of the machinery will be required to have been installed and tested under Special Survey in accordance with LR's Rules and Regulations.

[✠] **LMC** This notation will be assigned when the propelling arrangements, steering systems, pressure vessels and the electrical equipment for ~~essential~~ Mobility and/or Ship Type systems, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation, have been constructed, installed and tested under LR’s Special Survey and are in accordance with LR’s Rules for Naval Ships. Other items of machinery for propulsion and electrical power generation including propulsion gearing arrangements and other auxiliary machinery for ~~essential services~~ Mobility and/or Ship Type systems that are in compliance with LR Rules and supplied with the manufacturer’s certificate will be acceptable under this notation. The system arrangements of propelling and ~~essential~~ auxiliary machinery are required to be appraised by LR, and found to be acceptable to LR. *See* Vol 1, Pt 1, Ch 2, 6.3 Survey and inspection.

LMC This notation (without ✠) will be assigned when the propelling and ~~essential auxiliary~~ other machinery for Mobility and/or Ship Type systems, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation, has neither been constructed nor installed under Special Survey, but the existing machinery, its installation and arrangement has been tested and found acceptable. This notation is assigned to existing ships in service which are accepted or transferred into LR class.

MCH This notation will be assigned when the propelling and ~~essential auxiliary~~ other machinery for Mobility and/or Ship Type systems, *see* Vol 2, Pt 1, Ch 1, 3 Engineering system designation, has been installed and tested under LR’s survey requirements and found to be acceptable to LR. Items of machinery and equipment for propelling and auxiliary machinery for ~~essential services~~ Mobility and/or Ship Type systems supplied with the manufacturer’s certificate will be acceptable under this class notation. The system arrangements of propelling and essential auxiliary machinery are required to be appraised by LR, and found to be acceptable to LR. *See* Vol 1, Pt 1, Ch 2, 6.3 Survey and inspection.

(*Part only shown*)

3.9.2 The following class notations are associated with the machinery control and automation, and may be assigned

IP This notation may be assigned to a ship classed with LR when the arrangements of the machinery are such that the propulsion equipment and all ~~the essential auxiliary~~ other machinery for Mobility and/or Ship Type systems, see Vol 2, Pt 1, Ch 1, 3 Engineering system designation, is integrated with the power unit for operation under all normal sea-going and manoeuvring conditions. The system is to be bridge controlled and the propulsion equipment is to incorporate an emergency means of propulsion in the event of failure in the prime mover. It also denotes that the machinery and control equipment have been arranged, installed and tested in accordance with LR’s Rules.

3.10 Other notations

(*Part only shown*)

3.10.1 **LAP.** This optional special feature Class notation will be assigned to the ship in respect of the lifting appliances fitted which are designed and built in accordance with LR’s *Code for Lifting Appliances in a Marine Environment* (LAME) or equivalent standard, but where it is not mandated by the LA notation, *see* Vol 1, Pt 1, Ch 2, 1.1 Framework of Classification. This notation will be assigned in association with a ~~register of lifting appliances~~ Register of Lifting Appliances listing the appliances covered. The ~~register, which is to be attached to the Classification Certificate,~~ Register of Lifting Appliances is the responsibility of the Owner and should include the following lifting appliances, where fitted as appropriate:

■ *Section 4*
Surveys – General

4.1 New construction

4.1.1 When it is intended to build a ship for Classification with LR, constructional plans and all particulars relevant to the hull, equipment and machinery, as detailed in the Rules, are to be submitted for the approval of LR before the work is commenced. Critical Areas (*see* Vol 1, Pt 1, Ch 3, 1.5 Definitions) will be identified at this stage. Any additional plans submitted will not be subject to appraisal or approval without separate agreement. ~~Any~~ Proposals for any subsequent modifications or additions to the scantlings, arrangements or equipment shown on the approved plans are also to be submitted in writing and on plans for approval~~, under separate arrangements~~.

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4.6 Surveys for novel/complex systems, machinery and equipment

4.6.1 Where novel/complex systems, machinery and equipment have been accepted by LR and for which existing survey requirements are not considered to be suitable and sufficient, appropriate survey requirements are to be derived as part of the design approval process. In deriving these requirements LR will consider, but not be limited to, the following:

(a) Plan appraisal submissions;
(b) Risk Assessment documentation where required by the Rules;
(c) Equipment manufacturer recommendations;
(d) Relevant recognised National or International Standards.

Existing sub-Sections 4.6 *to* 4.10 *have been renumbered* 4.7 *to* 4.11.

■ *Section 6*
Classification of machinery with [✠]LMC or MCH notation

6.3 Survey and inspection

(*Part only shown*)
6.3.1 The manufacturer's certificate for acceptance of machinery and equipment for assignment of the [✠] **LMC** or **MCH** notation is to be in the English language and include the following information:

The manufacturer is to have a recognised quality management system ~~certified by an IACS member or a Notified Body~~ that is acceptable to LR.

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Periodical Survey Regulations

Effective date 1 January 2016

■ *Section 2*
Annual Surveys – Hull, machinery and optional requirements

2.3 Machinery

2.3.13 For ~~main propulsion, essential auxiliary~~ Mobility, Ship Type and emergency machinery control engineering systems, a general examination of the equipment and arrangements is to be carried out. Records of modifications are to be made available for review by the attending Surveyor. The documentation required by Vol 2, Pt 9, Ch 7 Control, Alerts and Safety Systems, including configuration management, is to be reviewed following system modifications to confirm compliance with applicable Rules. Satisfactory operation of the safety devices and control systems is to be verified. For ships having **UMS** or **CCS** notation, a general examination of the control engineering equipment required for these notations is also to be carried out.

■ *Section 4*
Docking Surveys and In-water Surveys

4.2 Docking Surveys

(*Part only shown*)
4.2.13 When Machinery Naval Class has been adopted, the following items are additionally applicable. The work is to be carried out in accordance with maintenance manuals and the manufacturer's recommendations for servicing and renewals observed.

(e) Visible parts of side thrusters are to be examined. Other propulsion systems which also have manoeuvring characteristics (such as directional propellers, vertical axis propellers, water jet units) are to be examined externally with focus on the condition of gear housing, propeller blades, bolt locking and other fastening arrangements. Sealing arrangements of propeller blades, propeller shaft and steering column are to be verified.
~~(e)~~(f) Where water jet units are fitted, the impeller, hull ducting, grating, nozzle steering and reversing arrangements are to be examined as far as practicable.
~~(f)~~(g) Where podded propulsion units are fitted, the bearings and sealing arrangements, steering ring and thrust bearings in the hull are to be examined as far as practicable.

■ *Section 7*
Machinery survey – General requirements

7.2 Complete Survey

7.2.4 The following auxiliaries and components are also to be examined:

(a) Auxiliary engines, auxiliary air compressors with their intercoolers, filters and/or oil separators and safety devices, and all pumps and components used for ~~essential services~~ Mobility or Ship Type systems.
(b) Steering machinery.
(c) Windlass and associated driving equipment, where fitted.
(d) The holding down bolts, chocks of main and auxiliary engines, gearcases, thrust blocks and intermediate shaft bearings.
(e) Evaporators (other than those of vacuum type) and their safety valves, which should be seen in operation under steam.

7.2.5 All Ancillary systems are to be examined to ensure that there have been no modifications to the system that change the category, and no degradation that impacts on other systems or basic conditions on board.

~~7.2.5~~ 7.2.6 All air receivers for ~~essential services~~ Mobility or Ship Type systems, together with their mountings, valves and safety devices, are to be cleaned internally and examined internally and externally. If internal examination of the air receivers is not practicable, they are to be tested hydraulically to 1,3 times the working pressure.

~~7.2.6~~ 7.2.7 The valves, cocks and strainers of the bilge and salvage system including bilge injection, are to be opened up as considered necessary by the Surveyor and together with pipes, are to be examined and tested under working conditions. The fuel oil, feed, lubricating oil and cooling water systems, also the ballast connections together with all pressure filters, heaters and coolers used for ~~essential services~~ Mobility or Ship Type systems, are to be opened up and examined or tested, as considered necessary by the Surveyor. All safety devices for the foregoing items are to be examined.

Existing paragraph 7.2.7 *has been renumbered* 7.2.8*.*

~~7.2.8~~ 7.2.9 Where remote and/or automatic controls are fitted for ~~essential machinery~~ Mobility or Ship Type System, they are to be tested to demonstrate that they are in good working order.

Existing paragraphs 7.2.9 *and* 7.2.10 *have been renumbered* 7.2.10 *and* 7.2.11.

■ *Section 8*
Turbines – Detailed requirements

8.1 Complete Survey

8.1.4 Condensers, steam reheaters, desuperheaters which are not incorporated in the boilers, and any other appliances used for ~~essential services~~ Mobility or Ship Type systems, are to be examined to the satisfaction of the Surveyor, and if it is considered necessary, they are to be tested.

■ *Section 9*
~~Oil~~ Reciprocating internal combustion engines – Detailed requirements

9.1 Scope

9.1.1 The requirements of this Section are applicable to reciprocating internal combustion engines, operating on liquid, gas or dual fuel, providing power for Mobility or Ship Type systems.

~~9.1~~ 9.2 Complete Survey

Existing paragraphs 9.1.1 *to* 9.1.4 *have been renumbered* 9.2.1 *to* 9.2.4.

~~9.1.5~~ 9.2.5 Where steam is used for ~~essential purposes~~ Mobility or Ship Type systems, the condensing plant, feed pumps and fuel oil burning plant are to be examined and the steam pipes examined and tested as detailed in Vol 1, Pt 1, Ch 3, 12 Steam pipes

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■ *Section 11* **Boilers**

11.1 Frequency of survey

11.1.1 All boilers, economisers, steam receivers, steam heated steam generators, thermal oil and hot water units intended for ~~essential services~~ Mobility or Ship Type systems, together with boilers used exclusively for ~~non-essential services~~ Ancillary systems having a working pressure exceeding 3,4 bar and a heating surface exceeding 4,65 m^2 are to be surveyed at intervals not exceeding 3 years and generally examined externally at the time of the Annual Survey of the ship.

■ *Section 13* **Screwshafts, tube shafts and propellers**

13.3 Screwshaft Condition Monitoring (SCM)

13.3.1 ~~Where oil lubricated shafts with approved oil glands are fitted or where a water lubricated sternbush is fitted and the requirements of Vol 1, Pt 1, Ch 3, 13.3 Screwshaft Condition Monitoring (SCM) or Vol 1, Pt 1, Ch 3, 13.3 Screwshaft Condition Monitoring (SCM) are met, a machinery notation **SCM** (Screwshaft Condition Monitoring) may be assigned.~~ Monitoring records are to be reviewed at annual survey for all vessels assigned the notation **SCM** (Screwshaft Condition Monitoring). The records that are to be maintained for oil and water lubricated bearings are detailed in the following Sections.

13.3.2 Oil lubricated bearing~~s~~ records are to be available on board that include the following:

(a) Lubricating oil analysis to be carried out regularly at intervals not exceeding six months. ~~The lubricating oil analysis documentation is to be available on board.~~ Each analysis is to include the following minimum parameters:

- ~~(i)~~ Water content.
- ~~(ii)~~ Chloride content.
- ~~(iii)~~ Bearing material and metal particles content.
- ~~(iv)~~ Oil ageing (resistance to oxidation), minimum testing to include Viscosity and Total Acid Number (TAN).

Note Oil samples are to be taken under service conditions and are to be representative of the oil within the sterntube.

(b) Oil consumption~~ is to be recorded~~.

(c) Bearing temperatures ~~are to be recorded (two temperature sensors or other approved arrangements are to be provided)~~ under sea going conditions.

~~(d) Facilities are to be provided for measurement of bearing weardown.~~

~~(e) Oil glands are to be capable of being replaced without withdrawal of the screwshaft.~~

13.3.3 Water lubricated bearing~~s~~ records are to be available on board that include the following:

(a) A ~~means of monitoring and recording~~ record of variations in the flow rate of lubricating water ~~using two independent sensors is to be provided~~.

(b) A ~~means of monitoring and recording~~ record of variations in the shaft power transmission~~ is to be provided~~.

(c) ~~A maximum permitted weardown of the sternbush is indicated and approved wear monitoring equipment is to be fitted. The weardown allowance will include both an absolute maximum allowable weardown and the weardown at which it is recommended to carry out an inspection and maintenance. An alignment analysis considering both the newly installed clearance and the proposed absolute maximum allowable weardown, demonstrating that the system will operate satisfactorily within these two limits is to be submitted for approval.~~ Wear monitoring records for the sternbush.

(d) For open loop systems ~~the manufacturer shall submit information regarding the required standard of lubricating water filtration and lubricating water filters or separators are to be fitted which are able to achieve this requirement:~~ the records from equipment for continuous monitoring of water sediment or alternatively records from an LR approved extractive sampling and testing procedure are to be available on board. Records of cleaning and replacement of lubrication filters/separators are to be maintained on board. The pumping and water filtration system is to be considered part of the continuous survey cycle and is to be subject to a Periodical Survey.

- ~~The lubricating water supply is to be fitted with continuous water sediment measuring or turbidity monitoring equipment with the results being recorded and retained on board alternatively.~~
- ~~There shall be a LR approved extractive sampling and testing procedure with the records held on board and made available to LR on request. Records of cleaning and replacement of lubrication filters/separators are to be maintained on board. The pumping and water filtration system are to be considered part of the continuous survey cycle and are to be subject to a Periodical Survey.~~

(e) ~~Where a~~ For closed cycle water systems, ~~is used then the pumping and water filtration systems are to be considered part of the continuous survey cycle and are to be subject to a Periodical Survey. Water analysis is to be~~ the records from water analysis results carried out regularly at intervals not exceeding six months are to be retained on board. ~~Samples are to be taken under service conditions and are to be representative of the water circulating within the sterntube. Analysis results are to be retained on board and made available to LR on request.~~ The analysis is to include the following parameters;

(i) Chloride content

(ii) Bearing material and metal particles content.

Note Samples are to be taken under service conditions and are to be representative of the water circulating within the sterntube. Records of cleaning and replacement of lubrication filters/separators are to be maintained on board. The pumping and water filtration system is to be considered part of the continuous survey cycle and is to be subject to a Periodical Survey.

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~~(f) The shaft shall either be constructed of corrosion resistant material or protected with an approved corrosion resistant protective liner or coating. Where a protective liner is used then this shall meet the requirements of Vol 2, Pt 3, Ch 2, 4.14 Corrosion resistant liners on shafts and a means of assessing the condition of this liner or is to be submitted and approved.~~

~~(g) Glands are to be capable of being replaced without withdrawal of the screwshaft.~~

~~(h) There is to be a shaft starting/clutch engagement block to inhibit starting the shaft until lubricating water flow has been established. This is to act as a starting block only. Low lubricating water flow after shaft start is to be signalled by an alarm only with no shutdown.~~

~~All data collected in Vol 1, Pt 1, Ch 3, 13.3 Screwshaft Condition Monitoring (SCM) is subject to the same audit requirements as given in Vol 1, Pt 1, Ch 3, 13.3 Screwshaft Condition Monitoring (SCM). The means of monitoring and recording lubricating water flow, bearing weardown and shaft power variation are to be submitted for approval.~~

13.3.4 For maintenance of the **SCM** notation, the records of ~~analyses, consumption and temperature, together with weardown readings~~ all data collected in 13.3.2 and 13.3.3 are to be retained on board and audited annually.

13.3.5 Where the requirements for the notation **SCM** ~~has been assigned~~ have been complied with, the screwshaft need not be withdrawn at surveys as required by Vol 1, Pt 1, Ch 3, 13.2 Normal surveys provided all condition monitoring data ~~is~~ are found to be within permissible limits and all exposed areas of the shaft are examined by a magnetic particle crack detection method or an alternative approved means for shafts with a protective liner, ~~*see* Vol 1, Pt 1, Ch 3, 13.3 Screwshaft Condition Monitoring (SCM)~~ or coating (*see* Vol 2, Pt 3, Ch 2, 6.1.3(f)). The remaining requirements of Vol 1, Pt 1, Ch 3, 13.2 Normal surveys are to be complied with. Where the attending Surveyor considers that the data presented is not ~~entirely to his satisfaction~~ sufficient to determine the condition of the shaft, the shaft ~~will~~ may be required to be withdrawn in accordance with Vol 1, Pt 1, Ch 3, 13.2 Normal surveys. For water lubricated bearings, the screwshaft is to be withdrawn for examination, as ~~in~~ Vol 1, Pt 1, Ch 3, 13.2 Normal surveys, when the ship reaches 18 years from the date of build or the 3rd Special Survey, ~~-~~ whichever comes first.

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General

Effective date 1 January 2016

■ *Section 6*
Building tolerances and associated repairs

6.1 Overview

6.1.1 The general tolerances for new building and subsequent repairs are to be in accordance with the requirements of the *Naval Survey Guidance for Steel Ships*, or an otherwise specified and agreed standard.

Volume 1, Part 3, Chapter 3

Ship Control Systems

Effective date 1 January 2016

■ *Section 2*
Rudders

2.24 Bolted couplings

(*Part only shown*)

Table 3.2.12: Rudder couplings to stock

Arrangement	Parameter	Requirement	
		Horizontal coupling	Vertical coupling
(1) Bolted couplings (*see* Note 4)	α_{max} (*see* Note 2)	$\cancel{\left(52,82 - 35,29K_o\right) - \frac{{d_s}^3}{F_R h10^6} - \left(1,8 - 6,3\frac{R}{d_s}\right)\frac{t_f - t_{fa}}{t_{fa}}}$ $\left(53,82 - \frac{35,29}{K_o}\right)\frac{{d_s}^3}{F_R h10^6} - \left(1,8 - 6,3\frac{R}{d_s}\right)\frac{t_f - t_{fa}}{t_{fa}}$	

Volume 1, Part 3, Chapter 4

Closing Arrangements and Outfit

Effective date 1 January 2016

■ *Section 1*
Introduction

1.1 General

1.1.3 Requirements are given for watertight and weathertight steel hatches and doors, securing arrangements, coamings, also closing arrangements for other miscellaneous openings, ventilators, air pipes, magazine blow out plates~~,~~ and discharges ~~and outfit~~. For side shell doors for main opening and bow doors, *see* Vol 1, Pt 4, Ch 3 Special Features.

1.1.4 Requirements are also given for other outfitting arrangements including protection of personnel, lagging of structure and the fixing of equipment lifting eyes.

Existing paragraphs 1.1.4 *and* 1.1.5 *have been renumbered* 1.1.5 *and* 1.1.6.

■ *Section 2*
Hatches and miscellaneous openings on the weather deck

2.1 Hatch covers

Existing paragraph 2.1.2 *has been renumbered* 2.4.3*.*

Existing paragraphs 2.1.3 *to* 2.1.5 *have been renumbered* 2.1.2 *to* 2.1.4.

~~2.1.6~~ 2.1.5 Small hatches, including escape hatches, are to be situated clear of RADHAZ areas and RAS stores receiving areas and storing routes. Small hatches and their securing devices are to be easily operable by one person in the expected operating conditions; this is typically achieved if the maximum operating force does not exceed 150N. Where necessary, counterbalance weights, springs or other equivalent mechanisms are to be provided to assist the user in opening and closing the hatch. Any mechanism fitted is to be designed so as not to present a hazard to persons using the hatch. Failure of the mechanism is not to prevent the operation of the hatch.

2.1.6 Where practicable access hatches to below spaces are to be arranged to allow for the passage of personnel wearing breathing apparatus as well as the transfer of injured personnel. For this purpose the opening is to be a minimum of 600mm x 600mm. Hand holds and foot holds are to be located both within the space being accessed and externally in the vicinity of hatch so as to enable ease of access.

2.4 Hatchways within enclosed superstructures or lower decks

~~2.1.2~~ 2.4.3 Consideration should be given to positioning weathertight or gastight hatches on lower decks in accordance with a specified standard for CBRN purposes.

■ *Section 4*
Watertight doors and hatches in watertight subdivision boundaries

4.1 General

4.1.9 Where practicable watertight access hatches in vertical watertight subdivisions are to be arranged to allow for the passage of personnel wearing breathing apparatus as well as the transfer of injured personnel. For this purpose the opening is to be a minimum of 800mm x 600mm. Hand holds and foot holds are to be located on both sides of the subdivision in the vicinity of the hatch so as to enable ease of access.

■ *Section 8*
Scuppers and sanitary discharges

8.1 General

8.1.9 Piping within tanks is to be tested in accordance with the ~~Naval Ship Survey Procedures Manual~~ *Naval Survey Guidance for Steel Ships*, or an otherwise specified and agreed standard.

■ *Section 9*
Bulwarks, guard rails, raised walkways and other means for the protection of crew and embarked personnel

9.1 General requirements

9.1.1 Bulwarks or guard rails are to be provided at the boundaries of exposed decks. Bulwarks or guard rails are to be not less than 1,0 m in height measured above sheathing, and are to be constructed as required by this Section. Consideration will be given to cases where this height would interfere with the normal operation of the ship. Guard rails provided around aircraft operating areas may be of the type which drop outwards with nets~~, provided access is restricted to essential personnel.~~ which are to comply with 9.6 Safety Nets. Droppable guard rails must be capable of being secured in both the upright and lowered position. Where bulwarks or guard rails are undesirable, e.g. for radar signature purposes, alternative equivalent arrangements will be required. Guidance on radar signatures is provided in Vol 1, Pt 4, Ch 1, 4.1 Radar signature.

9.1.4 Guard rails are to be fitted with fixed, removable or hinged stanchions fitted no more than 1,5 m apart. Removable or hinged stanchions shall be capable of being locked in the upright position. When retracted, collapsed or removed, the guard rails are not to impede access/egress. Stowage is to be provided for portable stanchions and stays, sited adjacent to where they are to be used.

~~9.1.6 Stowage is to be provided for portable stanchions and stays, sited adjacent to where they are to be used.~~

Existing paragraph 9.1.7 *has been renumbered* 9.1.6.

~~9.1.8~~ 9.1.7 Satisfactory means for safe passage of personnel, in the form of guard rails, life-lines, handrails, gangways, underdeck passageways or other equivalent arrangements, are to be provided for the protection of the crew and embarked personnel in getting to and from their quarters, the machinery space and all other spaces used in the ~~essential~~ operation of the ship.

Existing paragraph 9.1.9 *has been renumbered* 9.1.8.

9.1.9 A means of passage over obstructions such as pipes or other fittings of a permanent nature is to be provided where practicable.

9.6 Safety nets

9.6.1 Safety netting used around flight decks is to be arranged so as to safely arrest the fall of personnel. For this purpose the netting is to be raised at the outboard edge by an approximate angle of 10 degrees to the horizontal. The netting is to extend a minimum of 1,25 metres in the horizontal plane. It is recommended that the outboard edge is not above the level of the landing area but in no case is it to protrude greater than 250mm. Materials for the netting are to be specially considered, due consideration is to be given to the fire resistance and weathering properties.

9.6.2 The design load applied to safety nets and their supporting structure is to be taken as 2,7kN per metre of netting acting at the centre of the net in addition to the self-weight of the structure. The sag of the net is to be considered when resolving this force at the inner and outer fixings of the net, *see* Figure 4.9.1. Where the netting terminates at a support, the full load is to be applied to the support. The stress criteria to be applied for supports and supporting structure are given in Table 4.9.2.

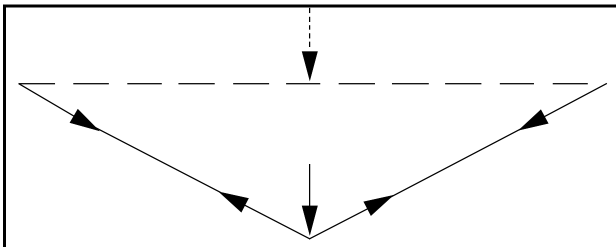

Figure 4.9.1: Safety netting sag

Volume 1, Part 3, Chapter 4

Table 4.9.2: Permissible stress

	Permissible stress
Bending and direct stress	$0{,}8\sigma_o$
Shear stress	$0{,}5\sigma_o$
Combined stress	$0{,}9\sigma_o$
Symbols	
σ_o = specified yield stress of the material, in N/mm^2	

9.7 Ladders

9.7.1 Fixed ladders of any type are to be designed in accordance with an appropriate recognised Standard, e.g. BSMA 39-1 *Vertical steel ladders*, BSMA 39-2 *Sloping steel ladders*.

9.7.2 Ladders may be constructed from alternative materials than those specified in the standards for the purposes of satisfying radar signature requirements. Equivalent levels of usability and robustness are to be demonstrated.

9.7.3 When the climbing height of a single ladder is 3m or more, fall arrest features are to be provided. Where practicable, staging platforms are to be provided for climbing heights in excess of 6m so as to divide the climbing height into multiple stages.

9.8 Means of embarkation and disembarkation

9.8.1 Accommodation ladders and embarkation ladders are to be in accordance with an appropriate recognised Standard, e.g. ISO 5488 *Accommodation ladders* or ISO 5489 *Embarkation ladders*.

Volume 1, Part 4, Chapter 1

Military Design

Effective date 1 January 2016

■ *Section 7*

Design guidance for nuclear, biological and chemical defence

7.6 CBRN hardening

7.6.5 Command and control centres should ideally be sited such that they are afforded the maximum protection against radiation from nuclear attack. All ~~essential~~ relevant Mobility and Ship Type equipment should be designed to resist incident nuclear radiation (INR) and nuclear electromagnetic pulse (NEMP).

Volume 1, Part 4, Chapter 2

Military Load Specification

Effective date 1 January 2016

■ *Section 5*
Underwater explosion (shock)

5.3 Notation assessment methodology

5.3.1 The shock performance required is to be specified by the Owner and is to include requirements for:
- Local strength assessment;
- Detailed design;
- Seat design, shock mounts and system hangers;
- Hull valve design and integration;
- Global strength assessment;
- Shock qualification/testing of equipment;
- 1st of class shock trial.

It is recommended that seats, valves, piping and equipment are categorised into ~~essential and non essential, *see also* Vol 2, Pt 1, Ch 1, 3.1 Categories.~~:
- equipment required to be capable of operation after the specified shock event;
- equipment that is required to be captive, with reduced or no operational capability after the specified shock event;
- equipment which has no requirements after the specified shock event.

See also Vol 2, Pt 1, Ch 1, 3.1.1.

■ *Section 10*
Aircraft operations

10.1 General

10.1.2 Attention is drawn to the requirements of National and other Authorities concerning the construction of helicopter landing platforms and the operation of helicopters as they affect the ship. Consideration ~~is to~~ should also be given to air flow over the landing area and the impingement of hot exhaust gases on equipment in the flight path.

10.1.7 Suitable arrangements are to be made to minimise the risk of personnel ~~or machinery~~ sliding off the landing area. A non-slip surface ~~and anchoring devices, and in the case of independent platforms, safety nets, are to be provided~~ is to be provided and is to cover the entire deck including any markings. Safety nets are to be provided in accordance with Vol 1, Pt 3, Ch 4, 9.6 Safety nets.

10.1.8 ~~Suitable fire-fighting equipment and services should be arranged on the landing deck, manoeuvring and parking areas, in accordance with the specified fire safety standard. Arrangements are to be made for drainage of the platform, including drainage of spilt fuel. Fire protection should also be arranged between spaces containing aircraft and other areas of the ship. Special consideration should be given to aircraft handling arrangements and the possible passage of spilt fuel.~~ Structural fire protection, firefighting equipment and services are to be arranged on and around flight operations areas of the ship in accordance with the specified fire safety standard, see Vol 1, Pt 1, Ch 2, 1.1.10.

10.4 Flight deck arrangements

10.4.6 Arrangements are to be made for the drainage of the flight deck and other aircraft handling areas, including drainage of spilt fuel. The drainage arrangements are to be made of steel and are to lead away from enclosed spaces and directly overboard so as to avoid entrapment of burning fuel should an accident occur.

10.4.7 Flight decks are to be bounded by a coaming of approximately 50mm which is to be an integral part of the drainage system.

10.4.8 Flight decks are to have at least two means of escape located as far away as practicable from each other.

10.14 ~~Tie down forces~~ Aircraft tie-downs

10.14.1 Aircraft tie-downs or general anchoring points are to be provided on the flight deck and in hangar spaces and are to be flush with the deck, when not in use.

Volume 1, Part 4, Chapter 2

~~10.14.1~~ 10.14.2 The forces to be used in assessing the ~~tie down~~ tie-down points ~~is to~~ are to preferably be determined ~~from the calculations for the securing arrangements, in accordance with LR's LAME Code~~ with regards to specific aircraft but where the aircraft is unknown the designer may propose reasonable assumptions. Consideration is to be given to the range of angles of application of the force due to the relationship between the aircraft undercarriage arrangement and the spacing and arrangement of the tie-down points.

10.14.3 Tie-down points are to be tested in accordance with a suitable testing regime agreed with LR.

Volume 1, Part 4, Chapter 3

Special Features

Effective date 1 January 2016

■ *Section 2*
Vehicle decks and fixed ramps

2.11 Openings in main vehicle deck

2.11.3 Inboard draining scuppers do not require valves but are to be led to suitable drain tanks (not engine room or hold bilges) and the capacity of the tanks ~~should~~ is to be sufficient to hold ~~approximately 10~~ at least 20 minutes of drenching water. The arrangements for emptying these tanks are to be approved and suitable high level alarms provided.

Volume 1, Part 5, Chapter 3

Local Design Loads

Effective date 1 January 2016

■ *Section 6*
Other local loads

6.3 Loads for windows and side scuttles in deckhouses and superstructures, P_{wi}

6.3.1 The design ~~normal~~ pressure, P_{wi}, for windows and side ~~lights~~ scuttles in deckhouses and superstructures is ~~given by~~ to be taken as:

$$P_{wi} = W_1 P_s \text{ kN/m}^2$$

In no case is the design pressure ~~for windows~~ to be taken less than $P_{wi,min}$ as given by:

$$P_{wi,min} = W_1 (10 + 0{,}04 L_R) \text{ kN/m}^2$$

Where $P_{wi,min}$ need not be taken as greater than 15 kN/m^2 for the third tier of deckhouses or superstructures and above.

where

$W_1 = 1{,}33 C_1$

~~z = vertical distance, in metres, from baseline to the structural element being considered~~

P_s is to be taken at the height of the deck below the ~~side light~~ window or side scuttle, *see* 3.2

C_1 is defined in Vol 1, Pt 5, Ch 3, 5.5 Loads for deckhouses, bulwarks and superstructures, Pdh.

~~*D* and *T* are defined in Vol 1, Pt 5, Ch 3, 1.3 Symbols and definitions.~~

Volume 1, Part 5, Chapter 3

6.5 Hangar doors and other large doors in superstructures

6.5.1 The design pressure, P_{ds}, for large doors in superstructures is to be taken as:
$P_{ds} = C_1 P_s$ kN/m^2

where

P_s is to be taken at the height of the deck on which the doors sits, *see* 3.2

C_1 is defined in 5.5.1.

Volume 1, Part 6, Chapter 1

General

Effective date 1 January 2016

■ *Section 2*
General requirements

2.2 Plans to be submitted

2.2.6 The following supporting documents are to be submitted:
- General arrangement.
- Capacity plan.
- Lines plan or equivalent.
- Dry-docking plan.
- Towing and mooring arrangements.
- Corrosion margin policy.

Volume 1, Part 6, Chapter 3

Scantling Determination

Effective date 1 January 2016

■ *Section 7*
Single bottom structures

7.4 Floors - general

7.4.1 The web thickness, t_w, of plate floors, is to be accordance with Vol 1, Pt 6, Ch 2, 2.9 Proportions of stiffener sections and is to be taken as not less than:

for NS1 ships

$$t_w = 0{,}9\sqrt{k_s}\left(\frac{d_f}{100} + 3\right) \text{ mm}$$

for NS2 and NS3 ships

~~$t_w = \sqrt{k_s}\left(\frac{3{,}4 d_f}{1000} + 2{,}25\right)\left(\frac{s}{1000} + 0{,}5\right)$ mm~~

$$t_w = \sqrt{k_s}\left(\frac{3{,}4 d_f}{1000} + 2{,}25\right)(S + 0{,}5) \text{ mm}$$

Volume 1, Part 6, Chapter 3

where

d_f is to be determined from Table 3.2.1 Minimum structural requirements

k_S and ~~s~~ S are as defined in Vol 1, Pt 6, Ch 3, 3.2 Symbols

Where the floor spacing, S is greater than 2,0 m it is recommended that the floor thickness is calculated by direct calculations.

7.4.4 The face flat thickness is to be not less than the thickness of the web plate. The ratio of the ~~web~~ breadth of the face flat to the thickness of the face flat is to be not less than 8 but is not to exceed 16.

■ *Section 9*
Bulkheads and deep tanks

9.1 General

9.1.7 For RAS tanks or other tanks subjected to increased loads such loads are to be indicated on the plans submitted.

Existing paragraph 9.1.7 *has been renumbered* 9.1.8.

~~9.8 Testing~~

~~9.8.1 The pressure to which the tanks will be subjected to in service is to be indicated on the plans submitted. The testing of tanks is to be in accordance with the naval ship survey procedures manual.~~

Volume 1, Part 6, Chapter 6

Material and Welding Requirements

Effective date 1 January 2016

■ *Section 1*
General

1.2 General

1.2.2 Specific requirements containing detailed information on testing, inspection and construction details can be found in the relevant Chapters of the ~~*Naval Ship Survey Procedures Manual*~~ *Naval Survey Guidance for Steel Ships*, or an otherwise specified and agreed standard.

1.6 Quality control

(*Part only shown*)
1.6.2 The extent and complexity of the quality systems will vary considerably depending on the size and type of ships and production output. LR will consider certification of the Builder in accordance with the requirements of one of the following systems:
(d) LR’s locally accepted Quality Control System – The Builder is implementing a documented Quality Control System which controls the following activities:
    (vi) Installation of machinery, ~~and essential~~ Mobility and Ship Type systems.

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